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What is Claimed:

1.   Wireless radiofrequency data communication system comprising:

- a base-station comprising multiple first sets and a signal processing-unit, wherein each first set comprises a transmitter- and receiver-unit provided with a transmitter and a receiver and at least one antenna which is connected to the transmitter- and receiver-unit, wherein the signal processing-unit is connected with each of the first sets for processing signals received by the first sets and processing signals to be transmitted by the first sets, and

- multiple second sets, wherein each second set comprises a transmitter- and receiver-unit provided with a transmitter and a receiver and at least one antenna which is connected to the transmitter- and receiver-unit, characterised in that, the signal processing-unit comprises information about the transfer-functions of radiofrequency signals from each of the antennas of the first sets to each of the antennas of the second sets and/or vice versa, and wherein the transmitters and receivers, both in the first sets and in the second sets, operate on essentially the same radiofrequency or radiofrequency-band, and wherein the signal processing-unit processes the signals received by the first sets and processes the signals to be transmitted by the first sets on the basis of said transfer functions such that for each second set of a plurality of the second sets an individual communication channel is formed with the base-station wherein these communication channels are generated simultaneously and separately from each other.

2.   Wireless radiofrequency data communication system according to claim 1, characterised in that, the communication channels are duplex communication channels.

3.   Wireless radiofrequency data communication system according to claim 2, characterised in that, the number of first sets is N and, in use, the number of second sets is M, wherein N is greater than M, wherein the signal processing-unit is provided with an inputport for imputing M signals to be received by the respective M second sets, wherein the processing unit is arranged to process the M signals in combination on the basis of the information of the transfer-functions to obtain N transmit-signals which are fed to the respective N first sets for being transmitted by the first sets to the second sets and wherein the processing unit is

8   arranged to process the M signals in combination in such a way that the M signals are received

9   separately by the respective M second sets if the second sets each receive the N transmit-

10   signals, thereby establishing M of said simultaneous communication channels.

1   4.   Wireless radiofrequency data communication system according to claim 3,

2   characterised in that, the processing unit is arranged to, in use, process, on the basis of the

3   information about the transfer-functions $\mathbf{H}$, the M signals $\mathbf{Q}$ to obtain the N transmit-signals

4    $\mathbf{R}$, to be transmitted by the first sets, according to

5    $$\mathbf{R} = \mathbf{P_D Q}, \qquad \text{(A)}$$

6   resulting in that the M signals $\mathbf{Q}$ are received separately by the respective second sets if the

7   second sets each receive the N transmit-signals, where $\mathbf{P_D} = [\mathbf{H}^*(\mathbf{H}^* \ \mathbf{H})^{-1}]^T$ is the pseudo-

8   inverse for $\mathbf{H}^T$ and where $\mathbf{H}^*$ is the complex conjugated and transposed of $\mathbf{H}$, wherein $\mathbf{H}$ is a

9   complex [N * M] matrix containing transfer functions h_{ij} (i=1,...,N; j=1,...,M), wherein h_{ij} is

10   the transfer function for transmission from the jth second set of the M second sets to the ith first

11   set of the N first sets, and where $\mathbf{Q}$ is a complex M dimensional vector $[Q_1, Q_2,..,Q_j,...,Q_M]^T$

12   wherein Q_j is the signal to be transmitted to the jth second set of the M second sets and where

13   $\mathbf{R} = [R_1, R_2,...,R_i,...,R_N]^T$ wherein R_i is the transmit- signal to be transmitted by the ith first set

14   of the N first sets.

1   5.   Wireless radiofrequency data communication system according to claim 1,

2   characterised in that,

3   the number of first sets is N and, in use, the number of second sets is M, wherein

4   N is greater than M, wherein, in use, each of the M second sets transmits a signal so that M

5   signals are transmitted to be received in combination by the first sets wherein the signal

6   processing-unit is arranged to process in combination signals received by each of the first sets

7   on the basis of the information about the transfer-functions to recover the M signals

8   transmitted by the M second sets separately from each other, thereby obtaining M of said

9   simultaneous communication channels.

1   6.   Wireless radiofrequency data communication system according to claim 5,

2   characterised in that, the processing unit is arranged to, in use, process, on the basis of the

3   information about the transfer-functions $\mathbf{H}$, the signals $\mathbf{r}$ which are received by the first sets, to

4   calculate an estimation x_est of the M signals $\mathbf{x}^c$ which were transmitted by the M second sets,

5   according to the mathematical expression

6
$$\text{x\_est} = \mathbf{P}_U\ \mathbf{r}, \qquad \textbf{(B)}$$

7   where $\mathbf{P}_U = [(\mathbf{H}^*\mathbf{H})^{-1}\mathbf{H}^*]$ is the pseudo-inverse for $\mathbf{H}$ and where $\mathbf{H}^*$ is the complex conjugated

8   and transposed of $\mathbf{H}$, wherein $\mathbf{H}$ is a complex [N * M] matrix containing transfer functions h_{ij}

9   (i=1,...,N; j=1,...,M), wherein h_{ij} is the transfer function for transmission from the jth second set

10   of the M second sets to the ith first set of the N first sets, $\mathbf{r}$ is a complex N dimensional vector

11    $[r_1,...,r_i,...,r_N]^T$ with r_i the signal received by the ith first set of the N first sets, x_est is a

12   complex M dimensional vector $[\text{x\_est}_1,...,\text{x\_est}_j,...,\text{x\_est}_M]^T$ where x_est$_j$ is an estimation of

13   x^c_j, and where $\mathbf{x}^c$ is a complex M-dimensional vector $[x^c_1,...,x^c_j,...x^c_M]^T$, with x^c_j being the

14   signal transmitted by the jth second set of the M second sets.

1   7.   Wireless radiofrequency data communication system according to claim 6,

2   characterised in that each second set comprises a serial-to-parallel/parallel-to-serial unit, which

3   unit, in use, splits the data signal of said second set in a multiple of signals, and means for

4   modulating these signals on different frequencies according to the Inverse Fast Fourier

5   Transformation, and wherein each first set comprises a unit for executing a Fast Fourier

6   Transformation on the signals received by said first set and means for combining the

7   transformed signals in order to recover said data-signal.

1   8.   Wireless radiofrequency data communication system comprising in use:

2   • k_1 multiple first groups, wherein each first group comprises a transmitter-unit and at least

3   one antenna which is connected to the transmitter-unit for transmitting a signal; and

4   • k_2 multiple second groups, wherein each second group comprises a receiver-unit and at

5   least one antenna which is connected to the receiver-unit,

6   characterised in that, the wireless radiofrequency data communication system

7   further comprises a signal processing-unit which is, if $k_1 > k_2$, connected to each of, the first

8   groups and which is, if $k_1 < k_2$, connected to each of, the second groups, wherein the signal

9   processing-unit comprises information about the transfer-functions of radiofrequency signals

10 from each of the first groups to each of the second groups and/or vice versa, and wherein, each

11 of the transmitter-units, of the first groups operates on essentially the same radiofrequency or

12 radiofrequency band, and wherein, in use, if $k_1 > k_2$, the signal processing-unit processes k_2

13 data-signals to be transmitted to the k_2 second groups for obtaining k_1 signals which are

14 supplied to the respective first groups to be transmitted, wherein the k_2 data signals are

15 processed on the basis of said transfer functions in such a manner that the respective second

16 groups will receive separately the respective k_2 data-signals, thereby establishing k_2

17 simultaneous communication channels, and wherein, in use, if $k_1 < k_2$, the signal processing-

18 unit processes k_2 signals, which are received by the respective second groups on the basis of

19 said transfer functions in such way that an estimation is made of the k_1 signals transmitted by

20 the first groups, thereby establishing k_1 simultaneous communication channels.

1 9. Wireless radiofrequency data communication system according to claim 8,

2 characterised in that each first group comprises a serial-to-parallel/parallel-to-serial unit, which

3 unit, in use, splits the data signal in a multiple of signals, and means for modulating these

4 signals on different frequencies according to the Inverse Fast Fourier Transformation, and

5 wherein each second group comprises a unit for executing a Fast Fourier Transformation on

6 the signals received by said second group and means for combining the transformed signals in

7 order to recover said data-signal.